PhD Research Proposal

Transforming Science into Technology – Issues and challenges of research publications faced by Indian scientists with reference to patenting

at

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Title

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A] Introduction

An invention is defined as a creation (design or process) resulting from study and experimentation. The technical excellence of an invention matters far less than the economic willingness of the customer or client to explore it. In other words, any system designed to encourage innovation needs to encourage actually making use of the innovation. There is an increasing need in universities and academic research to direct basic inventions/research to IPR protection rather than publication of the invention. Academic patenting has assumed importance during last twenty-five years in the US universities and patents have been used as mechanisms through which academic inventors shape entrepreneurial firms established to commercialize their scientific ideas. This has led to the emergence of patenting culture in university science. The patenting culture has been studied empirically with the increase in commercialization of science. The school of thought is that science-based entrepreneurial firms are a key feature of the modern economy. The intellectual capital contributed by these firms is soon converted into financial capital.

The success of US universities has led to thinking in India that above model of US universities in patenting inventions needs to be adopted as it can lead to commercialization of science and promotion of ventures thereby benefiting institutions and scientists themselves. Patenting is still not very common among academic researchers in India, although some of the top-tier institutions have put in place institutional structures to encourage patenting of their research outputs. Academic research is conceptualized as a research production process where research inputs (like research time and number of research scholars) are transformed into research outputs in the form of publications and patents. Research inputs by a faculty member to be an outcome of his/her own decision-making process, which in turn determine his/her research outputs. Exogenous parameters, like faculty background, faculty attitude, research sponsorship and institutional factors, are expected to influence both set of endogenous variables (research inputs and outputs). However, during the last century, basic scientific research has got a fillip within the university system, and has a direct and profound influence on the global frontiers of

technology. The importance of university generated research ideas in promoting innovations for economic growth and competitiveness of industrialized economies is well acknowledged in literature. However, the research mandate of universities and public-funded organizations extends well beyond mere commercial or industrial application of their research outputs; advancing the frontiers of knowledge and generating human resources have been their twin principal objectives. Nevertheless, over the last three decades, new legal and institutional structures have been put in place within the university system to foster better university-industry linkages to ensure that ideas and inventions generated by academic research reach the marketplace. It is with this objective in mind that the there is an increasing pressure being put by institutions and funding agencies on Indian scientists to patent their findings before publishing. This is making many of the scientists very much uncomfortable as they feel that their job is to do science and share the results of research with their peers for the advancement of science. They have been brought up in the culture of publishing research work, rather than trying for patenting. They are constantly being told that by not paying attention to patenting, they are sometimes putting valuable information into public domain and it is being used by others to convert into products and processes which are very often patented by others. As a result of which it is believed that the Indian scientist are losing out on opportunity to encash their knowledge.

B] Rationale and significance of the study

The objective of the proposed research is to examine whether the publications of Indian scientists are used to apply the new concepts to patented products and or processes. Intellectual Property Rights related concerns did not bother Indian scientists for long. Dedicating research outputs to public domain for free use and follow-on research has been a standard practice. Publications facilitate dissemination of research results in the public domain and establish natural copyrights. Patents protect Intellectual Property Rights on university inventions as a conscious and concerted effort to facilitate technology transfer. 75% of all patents granted in India are to foreign citizens (2006-2007). It is observed that though public funded system of higher learning has been successful in generating adequate scientifically trained manpower, it has not contributed significantly to usher in competiveness and technological learning by the Indian industry. Despite active research pursuits, industry interface has remained sub-optimum as reflected in patenting, licensing and commercialization of university research. In a sample study less than half of the faculty members have engaged in patenting activity, only a handful of university patents have

been licensed. Examples of successful commercialization of these licensed innovations are hard to come. A preliminary study was conducted to understand the research question elaborately. The case study taken was the patents referring the work of Prof. C N R Rao. Professor C.N.R. Rao is a world-renowned authority in the field of Chemistry. He is the Linus Pauling Research Professor and Honorary President of the Jawarharlal Nehru Centre for Advanced Scientific Research at the Indian Institute of Science, Bangalore. He is a Foreign Associate of the National Academy of Sciences and a Founding Fellow of the Third World Academy of Sciences. Professor C.N.R. Rao's contributions to the field of solid-state chemistry and materials science are remarkable for their enormous diversity, their originality, and their extraordinary prolificity. He has published over 1000 research papers and edited or written 35 books in a career spanning over 40 years. A study of patent literature was carried out, which revealed that there were 14 US patents that referred to Prof. C N R Rao's research publications. To elaborate, an example can be cited. A patent US6146602, describes an invention on "Mesoporous oxide molecular sieves for absorbing nitrogen oxides in oxidizing engine exhaust gas" The patent cites publication by Prof. C N R Rao titled "High Catalytic Efficiency of Transition Metal Complexes Encapsulated in a Cubic Mesoporous Phase". This publication reveals the specificity of the metal complexes encapsulated in mesoporous aluminium phase. This study demonstrates the high catalytic potential of transition metal complexes encapsulated in mesoporous aluminium phase in oxidation reactions. The patent US6146602 reveals catalyst comprising a mesoporous aluminium complex. The catalyst is useful to absorb nitrogen oxides from lean-burn engines when the exhaust gas is oxidizing, which may be gasoline or diesel engines. Thus the patent is based on the concept of catalyst comprising of mesoporous metal complexes in oxidation reactions. Prof. Rao has demonstrated this idea in the above mentioned research publication. The research publication is dated 1998 while the patent was applied on 08/02/1999. This is just an indication and we may be able to establish a connection between the content of the paper and the concepts being used in the patents and the significance of the patents can be further studied.

Thus there is a need to do a detailed study focusing on the publications of highly respected and recognized Indian scientists by looking for citations of their publications in issued patents. This proposed study will help to prove or disprove the hypothesis that Indian scientists are losing out on the opportunity to encash their inventions by not opting for patenting.

Objectives

- To analyse/study

- The scientific publications, of top-level Indian scientists, cited in patents
- To understand if Indian scientists are losing out on opportunity to encash their invention by not opting for patenting
- Whether there is a need to define and factor in the role of publication as prior art while patenting one's own invention and others invention

Research Questions:

- What is nexus between inventions of Indian Scientists, patenting and good technology and ultimately the social and industrial development in India
- Should patenting be prioritized over publication for inventions carried out by Indian scientists
- What are the legal protection mechanisms and what are the reforms and approaches required to protect the inventor in the transition of science to technology?

E] Methodology

It is proposed to carry out an empirical study to examine the hypothesis whether Indian scientist are losing out on opportunity to patent. The study would begin by short-listing 100 top most scientists in India. A list will be drawn from the list of Bhatnagar Award Winners, Fellows of the Indian National Science Academy, Indian Academy of Sciences and Indian Academy of Engineering. A list of their publications will be collated and a short list of their most cited patents will be drawn up. This will be followed by search of patent databases to see whether their most cited papers have been cited into any of the patents. We will also see if other papers that are not cited frequently in the scientific literature have also been cited in patent literature. In the case of cited papers, we will try to find a correlation between the central idea of cited paper(s) and the concept/inventive idea of corresponding patent(s). This will give us an idea about whether any knowledge of commercial value has been published that would have given an advantage to the institution if the output was patented first instead of publishing first. We may also try to develop a Patent Citation Index for the papers that are cited in the patent documents. It may be possible to develop a correlation between Science Citation Index and Patent Citation Index. We will be able to check the legal status of patents and that will give us an idea about whether the patents have been

licensed and search on internet may be able to give us some information whether products based on these concepts/patents have been commercialized.

We plan to document success stories of academic patenting in the form of case studies.

F] Year wise Plan

Sr. No.	YEAR	PLAN OF WORK
1	FIRST	- Short listing of 100 most prolific scientists based on their peer recognition, publications and citations - Search and analysis of patent databases to find citations of above publications in patents
2	SECOND	- To determine relationship between concepts in papers and inventive ideas in patents - To develop concept of Patent Citation Index and develop relationship between Science Citation Index and Patent Citation Index
3	THIRD	-Analysis, Preparation of case studies and report writing on conclusions

G] Bibliography

1. Patent and literature databases available online

2. Publications of scientists in various leading journals.